

The Canadian Entomologist.

VOL. XVI.

LONDON, ONT., JUNE, 1884.

No. 6

ENTOMOLOGY FOR BEGINNERS.

BY W. HAGUE HARRINGTON, OTTAWA.

NOTES OF A JUNE RAMBLE.

My office duties prevent me, unfortunately, from going afield during almost the entire month of July in each year, and perhaps a few notes on my last ramble, 29th June, may interest the inexperienced, and indicate some of the insects to be found at this time. The special aim of this ramble was to visit a grove of hickories, *Carya amara*, and investigate the insects occurring in these trees, but I desired also to obtain Coleoptera and Hymenoptera, especially sawflies.

My outfit consisted of a flat beating-net constructed so as to be folded up snugly when not in use; a sweeping-net on a folding pocket-ring; a bottle containing coarse sawdust, with a morsel of cyanide for beetles; a wide-mouthed bottle lined with blotting paper, and having some cyanide in a cavity in the cork, for Hymenoptera, Diptera; a couple of boxes for larvæ, and last, but not least, a note-book and pencil. The day is favorable, the sun shining hotly, yet tempered by a slight breeze. My first capture is a half-grown *Cimbex* larva under an elm tree in the city, and in passing through the lumber yards I obtain *Buprestis consularis* and *Dicerca tenebrosa*. Along the river are seen many Neuroptera, including some fine species of Phryganidæ and Perlidæ. On the sides of a railway embankment (I am now in the Province of Quebec) grow a variety of young trees and other plants. The willows are first tried and yield very abundantly, *Diachus catarius* and *auratus*. Less numerous are *Monachus saponatus*, *Anomæa laticlavata*, *Agrilus torpidus?* and *A. fulgens*. I am pleased to capture a fine pair of *Saperda mutica*, as I have only hitherto taken them once. Among other beetles are *Trichalophus alternatus*, *Rhynchites cyanellus* and *Chrysomela multipunctata*, with larvæ of the same. On some trees a sawfly larva, yellow, hairy, with

rows of black spots, is very abundant, and there are also larvæ of lepidoptera, including one of a Catocala. The raspberry bushes, which a few days ago were alive with bees and wasps, are now almost deserted, but the wilted tips of many of the young shoots show that some enemy has been at work. It is found that a foot or so below the top they have been neatly girdled by two rings about half an inch apart, and that between these rings has been inserted into the pith a long cylindrical egg, that of *Oberea bimaculata*. From a small balsam poplar is obtained *Saperda moesta*, and an examination discloses the larvæ of different sizes in gall-like swellings, about an inch or two apart, along the shoots which are not half an inch in diameter. Near the root, where the stem is somewhat stouter, is found a much larger borer, which is apparently that of some moth. The hickory grove is now reached, and the first tree yields a fine *Saperda discoidea*, a very rare beetle here. From other trees the following beetles are obtained: *Dorcaschema nigrum*, *Liopus alpha*, *Lepturges querci*, *Leptostylus macula*, *Hyperplatys aspersus*, *Anthaxia viridicornis*, *Agrilus egenus*, *A. otiosus*, *A. bilineatus* and *Balaninus rectus*. Several tree-hoppers occur in various stages, including *Telamona unicolor* and *T. fasciata*. There are also some large flat half-grown bugs (yellow, with blackish markings,) one of which has killed a luna caterpillar about an inch long, and is sucking out its juices. The caterpillars of this moth are quite common, but generally smaller than the one mentioned, and a few larvæ of other moths are seen. Three specimens of the pretty little butterfly, *Thecla calanus*, are observed flitting about the trees, or settled upon the foliage. Space will not permit to mention the various galls, etc., which disfigure the leaves more or less. Scattered through the grove are a few oaks, some of which have the foliage noticeably disfigured by large globular woody galls placed upon the mid-rib of the leaf, which is much distorted and curled up. From these galls are just emerging small hymenopterous flies, with ample wings, of which I do not know the name. Some of the leaves are being devoured by brownish caterpillars, half an inch long, with a black head and a pair of black spines projected forward from one of the thoracic segments. They feed side by side in rows of five or six and eat the leaf from the tip downward. Upon these trees are found also the beetle *B. rectus*, which was upon the hickory, and which is remarkable for its extremely long and slender snout. Flying about through the grove are lovely butterflies, *Limenitis arthemis*, fresh evidently from chrysalis and almost persuading one to be a lepidopterist.

Descending now into a meadow, through which flows a sluggish brook, I fold up the beating-net and screw the sweeping-net into its handle, which hitherto has been only used to tap the branches with. The stream is bordered with clumps of alders, willows, etc., between which grow luxuriantly ferns and many herbaceous plants, with sedges and various grasses. Magnificent fritillaries are hovering about the blossoms of the milkweed, which are just beginning to open, while numbers of *Neonympha Boisduvalli* flit about with a peculiar jerky flight. Beetles do not appear to be as common as they sometimes are here, but I take several specimens of *Scirtes orbiculatus*, three species of fireflies and several allied beetles, with several species belonging to the other families, as Coccinellidæ, etc. Three or four kinds of sawfly larvæ are found but none of the perfect insects are seen. Two, or perhaps three, species of Chrysops are unpleasantly numerous, but are not nearly so aggressive as I find them in a pine wood, through which I return. This wood rings with the shrill music of the cicada and is enlivened by many butterflies in the more open portions, where other trees and plants occur. My captures during the ramble are perhaps fifty species of beetles and a few Hymenoptera. This number is less than half of what I frequently obtain, but the value of collecting depends not so much upon the number of species taken, as upon the observations which are made upon the habits of the various species.

July 3rd, 1884.

OBITUARY.

It is with a feeling of sadness that we record the death of our esteemed friend and companion, Prof. Francis Gregory Sanborn, which occurred at the residence of a friend in Providence, June 5, 1884, by an overdose of chloral, taken to allay a nervous affection, from which he was a sufferer. He was born in Andover, Mass., Jan. 18, 1838. His father, Dr. Eastman Sanborn, was born in Sanbornton, N. H., and settled as surgeon dentist in Andover.

Francis was of slender health from infancy. From a diary kept by his mother it appears that when he was two weeks old his life was despaired of for many days. He was born a naturalist, and very early developed

powers of close observation, and patient study—especially in the branch of entomology—and the common forms of life about us.

Graduating from Phillips Academy in 1858, especially did he excel in Greek and Latin—receiving his instruction directly from the Principal, Mr. Taylor—which became so useful to him in pursuing his favorite branches of Entomology and Conchology, in which he became an acknowledged expert.

He went to the State House in Boston in October, 1858, when he was employed in the State Cabinet until 1865, when he was engaged by the Boston Society of Natural History in the departments of Entomology and Ornithology, receiving the appointment as regular assistant in 1867, which position he held until 1872. In 1872 he accepted a position as teacher of Entomology and Microscopy in the Bussy Institute, connected with Harvard College. During the spring and summer of 1874 he was an assistant in the Geological Survey of Kentucky, under Prof. Shaler. With other gentlemen of the survey, he visited about fifty caves, including Mammoth Cave, chiefly with a view to ascertain the variations in temperature, and the present and extinct forms of animal life. In 1875 he was employed by the Smithsonian Institution in arranging the coleoptera of North America for the Centennial Exhibition. This collection was shown in twenty-four large cases in the Government Building. Since then he has been engaged in museum work, arranging and labelling private cabinets, giving lectures before schools and clubs, on Entomology chiefly. Until 1882 he was employed as regular custodian in the Museum of the Worcester Natural History Society, which office he held at the time of his death. His work in museums, on private cabinets, and in arranging biological collections, giving on clear and distinct labels the history of the objects, making them plain and intelligible to the people, was one of the many things in which Mr. Sanborn excelled. He studied the common things of life—those which immediately surround us—and there was rarely anything in animal or vegetable life as to which he could not gratify an intelligent curiosity, and give a correct answer, and he delighted to do so. From a notice of his death in the Worcester Spy, we quote the following :

“ He was ingenious, full of resources, remarkably ready and happy in communicating information to all inquirers ; of a cheerful, buoyant and uncomplaining temper, with the simplest tastes and habits ; he was a diligent student, an agreeable and unobtrusive companion. His death seems sudden and untimely, but it is certain that he himself, unworldly as

he was, would have regarded its approach with equanimity. The Natural History Society has lost in Prof. Sanborn its most important and valued helper. His presence will long be sadly missed by visitors to the museum, and his successor, whoever he may be, will not surpass the genial and helpful custodian, who, in his own quiet and unostentatious way, has done such solid and lasting service for the cause of popular science."

A careful and painstaking student, he contributed to science services of which others reaped the benefits. Dr. Harris' work, "Insects Injurious to Vegetation," owes much of its value to the patient labors of Professor Sanborn.

He was corresponding member of several entomological societies in the States, and Life Member of the Boston Society of Natural History.

T. A. D.,
Worcester, Mass.

ON *VALGUS CANALICULATUS* AND *SQUAMIGER* :
ELLESCHUS BIPUNCTATUS, *XYLORYCTES*
SATYRUS.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

Valgus canaliculatus Fab. and *V. squamiger* Beauv., have, so far as I am aware, escaped the notice of American writers on Coleoptera, except that it is mentioned in the U. S. Agricultural Report for 1868, p. 90, that *V. squamiger* was found in great numbers in January, in Maryland, under the bark and in the rotten wood of a pine stump; and that Fitch gave some account of it, under the name *seticolis*, in his report for 1857, p. 695, which I have not seen.*

* Fitch's description is as follows :—

"BRISTLY-NECKED VALGUS, *Valgus seticolis* Beauv.—Beneath the bark around the crown of the roots of ant-eaten pine stumps, feeding upon the wood, fleshy, white, thick cylindrical grubs, resembling small larvæ of the May beetle, having three pairs of legs anteriorly and the body curved into an arch, its hind part being bent more or less inward under the breast, divided by impressed transverse sutures into twelve rings; the pupæ and perfect insects also occurring in the same situations; the latter short thick beetles about 0.28 long, the males chestnut brown, beneath black, the females dull black, both sexes with chestnut colored feet, and covered more or less with little ash gray scales, flattened upon their backs, their wing covers much shorter than the abdomen and

Having been described originally in Europe, and introduced, like many others, into our Catalogues uncharacterized, collectors here have to depend on tradition for a knowledge of the species. When recent and fresh there is no trouble in distinguishing them by differences in color and the arrangement of the scales; but with age and abrasion these disappear in many individuals, and anatomical characters have to be resorted to.

Normally, *canaliculatus* is ferruginous, and has the elytra with feebly impressed striae, the base, middle and apex being covered so densely with whitish scales as to produce a tri-fasciate appearance. The sides of the thorax are likewise densely coated with scales similarly colored. *squamiger* is darker, slate-colored, or blackish brown. The scales are narrower and more uniformly distributed, but condensed on the centres of the disk of each elytron, so as to form a small round white spot, often obsolete. The striae of the elytra are scarcely traceable.

It is not necessary for our purpose to relate minor anatomical differences, as there is one easy of observation that can always be relied on to separate doubtful individuals, namely, the epistoma and clypeus.

In *canaliculatus* this is short, somewhat convex, slightly channeled in the centres, with a *deep notch or depression* at the middle of the anterior margin.

In *squamiger* the same part is prominent, somewhat broadly concave, with the anterior margin *rounded*. These curious little beetles occur here abundantly on flowers from April till July, and occasionally till late in autumn. They hybernate in colonies, in crevices of standing trees in process of dry decay, where I have several times found them in large numbers.

Elleschus bipunctatus Linn. This is an introduced European species, first brought to notice by Dr. Leconte, Proc. Am. Phil. Soc., v. 17, p. 621,

marked with rather obscure impressed lines, a broad shallow groove along the middle of their thorax, which groove is more deep anteriorly, and their anterior shanks with a row of about five little uneven teeth along their outer edge.

"In the month of April last, I met with sixteen of these beetles beneath the bark of a pine stump, slightly above the surface of the ground. The stump had been much eaten, by white ants apparently, the sap wood being all consumed and the cavity thus formed being stuffed with sand and dirt which had been carried up from the soil beneath, in which these insects were lying, torpid in their winter quarters, most of them crowded together in a heap in a single cavity in this dirt, the others scattered about in it singly, their larvæ having no doubt subsisted upon the decaying wood."—[Ed. C. E.]

without the specific characters. Detroit and Marquette are given as the places of its occurrence.

I find it here very abundantly in June on a species of small willow growing in upland thickets, and its identification I owe to the kindness of Dr. G. H. Horn. The genus in which it is placed is sufficiently defined under the name *Alyca* in the monograph of the Rhyncophora. The species is of easy recognition. It is about 2 mm. in length; the color at maturity is dark brown to black when deprived of vestiture; the elytra are finely striate, with the intervals wide and almost plane; the whole insect is densely clothed with a grayish, prostrate, scaly covering, easily rubbed off, which on the elytra is longer and hairlike. The insect takes its name from two black denuded spots on the elytra at the middle; they are shaped like a horse shoe with the convexity anterior, and are formed by two longer denuded parallel lines on the second and fourth striae, united at the apex by a shorter one on the third. With age other spots are formed by abrasion, mostly near the base and apex, thus giving a tri-fasciate appearance. Specimens entirely nude would be difficult to determine, but fortunately for the collector, when found, the individuals are abundant.

Xyloryctes satyrus Fab. This large beetle is widely distributed, being found in Arizona, New Mexico, Texas, Kansas to Canada, and southward, and probably occurring wherever the ash and liquidambar grow. So far as known to me, but little has been written concerning it, and its life-history as given is mostly surmise. There is a wood cut of it in the U. S. Agricultural Report for 1873, with some remarks; and Mr. B. D. Walsh, Proc. Bost. Soc. Nat. Hist., v. 9, p. 287, states that the larvæ, which he briefly describes, live on the roots of grass.

In this latitude it emerges the latter part of June and beginning of July, and immediately resorts to the (white) ash, especially such as grow in open grassy places, at the roots of which it burrows, and may be taken in large numbers. The disparity between the sexes as to number is noticeable. On July 2nd fifty-five were taken at the base of a single tree, all of which were males except three. Thinking the females, as in some other species, would appear later, the same tree was again visited on the 10th, and forty-seven taken from the ground formerly dug over, thirteen being females.

Whether they eat anything is unknown, but being nocturnal, provided with well developed wings and having short, but sharp, toothed mandibles, it is probable they feed by night on the foliage of the ash. Certain it is they do not feed on the roots nor damage them in any way, and why this par-

ticular tree is selected, and for what purpose, is as yet unknown. Several times the eggs and young larvæ have been unsuccessfully sought for at the roots of the tree; and on the first of May this year a man was employed to dig at its roots; long trenches were cut in several directions, and to the depth of two feet, without finding larvæ or pupæ. The larvæ, which resemble those of *Lachnosterna*, but are distinguished by their "coal-black heads," as stated in the places above cited, are often found in grassy places, where I have also taken the beetle after disclosure. Now, since neither eggs, nor larvæ, nor pupæ, are found at the roots of the ash, and considering the comparative fewness of the females taken, Is it not probable that, after pairing, the latter resort to grassy places to oviposit?

At the place first cited is an extract from a letter from Mr. P. H. Foster, near Babylon, Long Island, who had a grove of over six thousand young ash trees, and from these it is stated his foreman dug up one bushel of these beetles, and that they had destroyed a number of his trees. The beetle itself is in this case certainly wrongfully accused, for it neither eats nor wounds the roots; but in case of small trees like these—"about eight feet in height"—the larvæ might have been so numerous in their vicinity as to have devoured the rootlets, by which nourishment is derived from the soil. Just what connection there is between the beetle and the ash and the liquidambar remains to be discovered, and it is to be hoped some entomologist residing in the country may be incited to a successful investigation.

Stridulation is effected in a manner I do not remember to have seen noticed, namely, by an arrangement within the acetabulum of the middle coxæ. This is very deep, and in the portion of the cavity belonging to the mesosternum is a large, polished, smooth space, divided by an acute carina; by rotating the coxæ the insect has the power at will to bring a certain part in contact with this carinated line, producing a shrill squeaking sound audible at a considerable distance. I have not succeeded in inducing them to come out of the ground to see what was going on, as narrated by your correspondent, vol. 12, p. 139.

To sum up, all that is now positively known of the life history of this beetle is, that in season it is taken burrowing at the roots of ash and liquidambar trees; that it exists in the larvæ state more than one year; and that some of its larvæ live on the roots of grass, and transform under stones, &c. All else is conjecture.

NOTES ON BUTTERFLIES, WITH DIRECTIONS FOR
BREEDING THEM FROM THE EGG.

BY W. H. EDWARDS, COALBURGH, W. VA.

(Continued from page 89.)

The eggs of butterflies are very interesting objects. As a rule, those of each natural genus (I speak of the North American fauna, for I know nothing of the eggs of tropical butterflies), are closely alike, as in *Pieris*, *Anthocharis*, *Colias*, *Terias*, *Callidryas*; and so, while each genus has peculiarities of its own, there is a family resemblance between these genera (of the sub-family *Pierinæ*). They are all of one general shape, long, slender, sub-conic, or spindle-shaped, set on end, but differently ribbed according to the genus. So the eggs of *Danais* and *Heliconia* and *Agraulis* each have their own pattern. All *Argynnis* eggs, whether of the large or small species (Groups 1 and 2), are thimble-shaped. On the other hand, *Euptoieta*, by its egg, is allied to *Argynnis*, while by the chrysalis, it is allied to *Melitæa*. It links the two genera, and in my Catalogue of Di. Lep., I place it between these two, instead of before *Argynnis*, as has usually been the arrangement. So *Melitæa*, *Phyciodes*, *Limenitis*, *Apatura*, *Paphia*, *Satyrus*, *Neonympha*, *Chionobas*, may all be distinguished as readily by the eggs as by the butterflies. *Lycæna*, *Lemonias*, *Thecla*, *Chrysophanus*, so far as I know them, all show generic peculiarities in the egg stage. So does *Papilio*, though some of the species, as *Philenor* and *Cresphontes*, have the surface covered with a rough crust, the usual type being smooth-surfaced. Now *Parnassius* is ranked as belonging to the *Papilionidæ* and to the sub-family *Papilioninæ*, which includes the genus *Papilio*. And here alone among the American butterflies, so far as the early stages are known, is an anomaly. By the egg, *Parnassius* should stand near *Lemonias* and *Lycæna*, while by the chrysalis it is near the *Hesperidæ* or some of the *Heterocera*. By the caterpillar, it is widely separated from *Papilio*, having a resemblance to that genus in but a single character, the tentacles on second segment. So it is that I am confident that in a proper systematic arrangement of families and genera, where the preparatory stages were taken into consideration, *Parnassius* would stand near *Lemonias*.

The eggs of *Hesperidæ* are largely dome-shaped, either sub-conic or half a sphere; of the latter type is *Ancyloxypha Numitor*, of the former

most of the Pamphilas, and these last are usually smooth, but some, like *P. Napa*, are indented like a thimble. Of this shape also are the eggs of *Megathymus* and *Pyrrhopyga Araxes*; others are melon-shaped and ribbed, as *Nisoniades* and *Eudamus*, and the egg of *Pamphila Zabulon* (an abundant species of its genus), is of this type. *Pholisora Catullus* has a thimble-shaped egg, ribbed vertically and crossed horizontally by lines, while the top is curiously indented in rounded ridges. It looks much like a confectioner's jelly-mould.

Dr. Weismann, *Descendence-Theory*, English edition, shows that the larvae of butterflies in nearly all genera have a morphological congruence with the imagines. "The morphological congruence between larvæ and imagines declares itself most sharply in genera, where it is the rule almost without exception. In this case, we can indeed be sure that a genus or sub-genus founded on the imagines, will, in accordance with correct principles, present a corresponding difference in the larvæ," p. 444. This is just as true of the egg stage of the American species, with fully 150 of which I am acquainted. Therefore this congruence makes the study of the preparatory stages important. Until recent years, very little attention has been paid to this matter, and Dr. Weismann is the first author so far as I am aware, who has treated the larval and pupal stages philosophically. Whenever eggs are obtained they should be described from the fresh example, the form and markings noted down, and whenever possible they should be examined under a powerful microscope. By all means, if it is practicable, a drawing should be made on a greatly enlarged scale. Two or three of each species should be preserved in alcohol or glycerine for future reference. Probably glycerine is best, as eggs taken out of alcohol are apt to collapse when dry, and ribbed eggs, like those of *Colias*, sometimes change in shape in alcohol, expanding in diameter, with flattening of the ribs. Small glass tubes are better than narrow-necked vials for keeping examples of eggs or young larvæ. From these last it is rather difficult to remove objects.

Most eggs are green when laid, yellowish, as in *Pieris*, *Colias*, and many *Papilios*, bluish, as in *Grapta*, grayish, as in *Limenitis*. *Lycæna* has a deep green surface concealed by a white net work, but which can be peeled off. *Parnassius* is white, *Pholisora Catullus* is brown; the *Hesperian* eggs as a rule are white. Many eggs turn red a few hours after deposition, as *Colias*, *Anthocharis*. *Mel. Phaeton* turns lake-red. And all these, as well as most other species, change to black before hatching,

as the dark larva can be seen through the transparent shell. The larva eats its way through the top or side of the egg, and sometimes makes its first meal from the shell, devouring more or less of it. The larvæ which go into lethargy directly from the egg seem to eat nothing but the shell before they descend to the base of the plant and range themselves for a long sleep. In this way behave all the larvæ of the larger Argynnids, of the fall brood, when there are two broods; so do the larger Satyrids, as *Alope*. Other larvæ hibernate after 2nd and 3rd moult, usually the 3rd, as the smaller Argynnids, *Myrina* and *Bellona*, Phyciodes, Melitæa, Apatura. Others hibernate at any stage where cold weather catches them, as Colias. Mr. Mead found hibernating larvæ of Colias under boards, in Illinois. In the arctic regions, the larvae of Colias never can reach chrysalis the same season in which the eggs are laid. Indeed, I do not see why larvæ might not be frozen for an indefinite period and come to life at last when weather was favorable. I have found that the best way to keep hibernating larvae in confinement alive through the winter months is to freeze them in the ice house, or in a snow-bank. The loss, after six months of this treatment, has been very light; whereas before I tried this method, very few and frequently no larvæ at all could be got through. They died from mould in the cellar, or from heat if in the house; if out of doors, they moved about on warm days and perished from starvation. I have found small paper boxes excellent to keep them in, druggists' pill boxes. And these are set in a tin box and placed directly on the ice. The rough surface of the box allows good foot-hold to the larvæ, and the boxes have not moulded. I carried some 60 larvæ of *M. Phaeton* through last winter, and with them larvæ of *Ap. Flora*, all of which were half-grown, or past the third moult, with no loss to speak of. And Argynnids *Diana*, *Cybele*, *Satyrus Alope*, and other species, which hibernate direct from the egg, have been carried with trifling loss. And the later the larvæ are left on ice the healthier they seem to be. It is better to rouse them when the weather is settled and mild, than earlier, when violent changes of temperature will occur. Most larvæ pass four moults, but in case of hibernating larvæ, there is an additional moult. So that the summer brood of a species, as of Apatura, will have four, while the winter brood will have five, three before hibernating and two after it. Great care is necessary with the young caterpillars. Many species are apt to wander, and must be confined from the first, but others, as *Limenitis*, move very little, and may be trusted to remain always at

home, provided their food plant is kept fresh; otherwise they certainly will wander. For convenience of observation, young *Limenitis* may be left on branches set in bottles of water, with no covering. So many *Papilios* move very little, resting in one spot for hours, but the larvæ of *Philenor* are particularly alert, and must be shut up. Most larvæ, in the younger stages, should not be touched by the finger or forceps, especially when they are near a moult. If it is necessary to change them from one leaf to another a bit of the leaf with the larvæ may be transferred, or the larvæ, if not near a moult, may be taken up by a camel's hair pencil. The habits of different species even from the moment they are hatched, are very interesting. *Lyc. Pseudargiolus* at once fixes itself on a flower bud of its food-plant, and bores a hole with its strong mandibles into the side large enough and no more to admit the head. The head is set on a long extensile neck, and the contents of the bud can be completely removed. According to Mr. W. G. Wright, the larvæ of *Lyc. Amyntula* eats into the pods of *Astragalus*, and lives on the young and immature seeds. The egg of *Thecla Henrici* is laid at the base of a flower stem of wild plum, and the young larva at once makes its way up the stalk and fastens on the young plum, boring into it just as the *Lycaena* bores into its bud, and till maturity eats nothing but the contents of plums, growing as they grow. *Lemonias Nais*, in confinement, stitched two leaves together and lined them with silk, came entirely out to feed and returned again to its nest. When about to moult, it closed the nest and was not seen for some days and till its new coat was fitted. All the species of *Limenitis* make perches by stripping bare the mid-rib of the leaf at the top. This would naturally curl up if left to dry, but the larva coats it with silk and stiffens it by binding on morsels of chewed leaf, and the perch remains straight. On this the larva rests the day long except when it goes to the leaf edge to feed, and feeding done it returns to the perch. This is the habit of the larva when first hatched, when its length is but one tenth inch, and the habit is kept up through the earlier stages. And connected with the perch is accumulated a little packet of scraps of leaf, just at the base of the perch, and as the substance of the leaf is eaten, the packet is rolled back so as to be kept pretty close to the cut edge. This rolling is done partly by pushing, what is gained at each effort being secured by threads, or successive threads are attached from the farther side of the packet to the edge of the leaf, and the thing is so turned over. After the second stage, that is, from 2nd moult, the packet is let alone,

and falls behind, as the perch lengthens. Now the object for which this packet is made, with all this labor, is yet unknown. These larvæ, when of the hibernating brood, in fall, make to themselves a close fitting jacket out of the leaf, snipping away here and there all superfluous parts till the pattern is cut out. Then the sides are drawn together by spun threads and held fast, and the whole interior is covered with a coating of silk. Moreover, the larva provides against the fall of its hibernaculum, by carefully weaving threads from leaf to stem and around the stem, so that the winds and storms of winter cannot possibly tear the case away. Now, the larvæ of the summer broods do not make any such cases, there being no need of them. Of all our larvæ, those of *Limenitis* show most of what in human beings would be called intelligence, working for a definite end, and varying their contrivances according to circumstances. Compared with them the larvæ of *Argynnis*, and *Danaïs*, and most other families are stupid. *Paphia Astyanax*, makes for itself a hibernaculum a good deal like that of *Limenitis*, but I have never had an opportunity of observing that species, and can give no description of its habits at work. Almost as intelligent as these case-makers, are some of the tent-makers, as *Melitæa Phaeton*, whose work is most finished of all its class. The eggs are laid in clusters of one hundred to three or four hundred, and the larvæ as soon as hatched knot their leaf into a nest the size of a small filbert. In course of the next two or three days they make a common web, taking in any leaf that lies convenient. As they grow they enlarge the web, all working for the common good. Especially, as each moult approaches, all wanderers come home, and the web is made tight, and into it they retire and pass the moult. Which over, the web is extended again; and so on, till finally when the third moult approaches, the web is often as large as a man's open hand made of closely woven silk, two and three coats of it, capable of resisting storms and all the wear and tear of winter. Up to this time a few holes have been left for egress, but at last these are closed up from the inside, and the larvæ are seen no more that year or after the third moult. If at any time from the hatching the web is injured by storms, the caterpillars forthwith set at work repairing, and do not rest, whether it rains or shines, till the work is done. And they have a prevision of storms and all hands may be seen working at their dwelling industriously, strengthening it here and there, even when the sky is clear, and there appears no reason for work. The food-plant is always in swampy places, often half under water, and the webs are beaten down by snow and rain, but the inhabitants get

through safely. When spring comes and the *Chelone* stems begin to sprout, these larvæ come forth and return no more to their old web. They now lie exposed to view on the plant, or on stumps, chips, fallen branches, enjoying the sunshine; pass two moults, and pupate. The butterflies are sluggish, but are not caught by birds, probably having some quality obnoxious to smell or taste, and the caterpillars seem to have a similar immunity. I accidentally discovered this season that they will bear considerable drowning, having left several in a glass of water for five hours. When I came back all were lying on the bottom of the glass, and I removed them to a piece of blotting paper under a tumbler. In another hour every one of them was crawling about, and they afterwards pupated. *Melitæa Chalcedon* makes a web in which it hibernates, much like that of *Phaeton*, but by the observations of Mr. Wright, it varies the nature of it according as the species lives in the valleys or at high elevation in the mountains. And in the valleys, the caterpillars go to ground to hibernate, while in the mountains they live in the webs.

Phyciodes Tharos is very near *Melitæa Phaeton*, and the eggs are laid in clusters, but the larvæ do not cover themselves with a web, but lie naked on the leaves, coming together and forming clusters when the moults take place.

The eggs of *Apatura Clyton* are laid in large clusters, 200 or more, and the young larvæ are highly gregarious but are not protected by a web. After the third moult, in the summer brood, however, they separate, each one living henceforth singly, and then it draws the edges of its leaf together and forms a loose case in which it is hidden. *Apatura Celtis*, on the other hand, is nothing like so gregarious as *Clyton*. The eggs are laid in clusters of 5 to 20, so far as I have observed, though in confinement the females may lay in one bunch 50 or more. But the larvæ after third moult scatter, and hide themselves as do those of *Clyton*.

Grapta Comma, in the larval stage, lives singly on the under side of a hop or nettle leaf, which it draws down till it becomes like the roof of a house, affording complete shelter from rain or snow. On the edges of this roof it feeds, and when the supply fails seeks another leaf. *Grapta Satyrus* has precisely such a habit. But the allied species, *G. Interrogationis*, lies naked on the under side of a leaf, with no effort at further protection, several larvæ often on one leaf. *P. Atalanta* is solitary from the start, the egg being laid on the terminal tuft of nettle or its other food plant. The young larva at once stitches the leaf together and lies in a

close case, This is shifted frequently as the larva grows, and affords food as well as shelter. *Papilio Troilus*, when it issues from the egg, proceeds to cut a slit at the edge of the leaf and folds down a bit thereof, stitching it closely; it lines the interior with silk and on this lies concealed, going out when forced to feed. This feeding is done at the upper end of the leaf, and when the shelter gets to be insufficient, another leaf is sought and treated in same manner. *P. Palamedes* has exactly such a habit. On the other hand, *P. Turnus* lies exposed to view on the upper side of a leaf, on a bed of silk, which forms a sort of bridge as the leaf is somewhat drawn together, permitting water that falls on the leaf to pass beneath it. The larva of *P. Asterias* rests on the stem of its plant entirely unprotected. The larvæ of *Colias* lie extended on the leaves, on the upper sides, along the mid-ribs, well protected by the resemblance in color to the leaf they feed on, clover or *Astragalus*, or *Amorpha*.

And so each species has its larval peculiarities which repay study.

I usually confine young larvæ, particularly when careful examination of them is desired, in glass tubes, and later transfer them to half-pint jelly glasses (tin-topped). These tubes are corked tight, and the leaves will keep fresh a long time in them. But they are usually examined once in 12 or 24 hours, and the larvæ removed to fresh tubes. The date of hatching is noted on a slip of paper, also the length of the larva, and this paper is pinned to the cork. Every morning a measure of length is taken and noted down. So the moults successively, and every moult is described, and all the changes set down in a note-book. If the larvæ are in a glass, a slip of paper is held down by the cover with all particulars written on it. Sometimes the individuals of a brood are kept singly through all their stages, but most often it is only necessary to watch for the successive moults, and to note the first and last larva to moult in that particular stage. The approaching moult may always be known by the swelling of second segment, and when any larva is observed in this condition it is separated from its fellows. While moulting injuries are apt to be received, which invariably result in the death of the larva, and therefore it is best to separate the subject to prevent disturbance from other larvæ. Many larvæ are cannibalistic, and if out of regular food and hungry, will devour their next neighbor without compunction; of this sort is *P. Philenor*. As I make alcoholic examples of each species at each moult, when possible, so I save the casts of faces at each moult for future reference and study, using small homœopathic tubes for this purpose.

Larvæ bear confinement in tight glasses well, and I often receive them from correspondents as distant as Florida, or California, through the mails, in good condition. The plants keep well in this sort of confinement also. I have never used what are known as "breeding cages," which are expensive if purchased, and are troublesome to make at home. The entomologists at the Agricultural Department, Washington, have large numbers of these cages, for all order of insects. The frames are of wood, about 18 inches high by 12 wide, one side opening on hinges. All the sides and the top are filled in with fine brass wire netting; the top fits over like the cover of a handbox, as it is often desirable to lift it off, and the whole thing rests on a tin base, so made as to hold earth, in case it is desired to have growing plants in the cage. So larvæ of Noctuidinæ, etc., may have earth in which to bury themselves. If the sides were not of wire, but of cotton netting, many species of larvæ would eat their way out, especially when about to pupate. On a recent visit at the Department, I could not learn the cost of such cages, but should suppose three or four dollars at least would be required for them. I found that the entomologists spoken of used tubes and glasses much as I have done for the younger larval stages; also they tie bags of guaze over growing plants in flower pots, as I often do. The bag should clear the top of the plant and leave a few inches to spare, and it is held up and spread by three sticks set in the earth. In raising the large Argynnids, *Diana*, *Cybele*, etc., violets are planted in the pots, and the larvæ do well confined by bags in the manner described. As fast as the plant is consumed another must be substituted. These larvæ make no effort to escape, rest on the earth or on the sticks, and pupate from the top of the bag. So all Satyrid larvæ are easily reared in this way. I make constant use of tin pails with tin covers, one and two quart, for many larvæ. Now, as I write, I have *Grapta Comma*, *Melitæa Harrisii*, *Limenitis Disippus* (nearly mature), and *P. Philenor* feeding in pails. They do perfectly well without light or sunshine. So do *Apaturas*, and in fact most larvæ. The food must be changed daily and the pails washed out and dried. As for large larvæ, as of the *Papilios*, I generally use powder kegs (wood) or nail kegs, one or the other of which can be had anywhere. Remove the top hoop, and use the second one to bind down the cotton cloth cover; put a little earth in the bottom, and in it set a two quart glass fruit jar filled with water, in which branches of the food-plant are placed. No farther care is required than to substitute fresh branches for the old ones

as the leaves are consumed, and the larvæ will go on to pupation. This is when it is desired to get chrysalids by wholesale. So larvæ may be left during several stages in bags or branches in the open, care being taken to protect them from the direct rays of the sun, or from the assaults of birds or other insects. This last may be done by a second bag outside the first, or by a screen of paper or cloth. But larvæ so treated must be brought in before they prepare for pupation, else many will eat their way out and escape.

But where observation of the larvæ is necessary, glass tubes and tumblers, and guaze-covered flower pots, and tin pails and nail kegs, will answer all the purposes of elaborate and expensive cages, and be more satisfactory, I apprehend. At any rate all my work is done in this way.

There are many northern species of butterflies, the history of which remains to be learned. Several species of *Colias*, *Interior*, *Occidentalis*, *Christina*, *Pelidne*; several *Argynnis*, all the boreal species, and most from the Rocky Mountains, also *Atlantis*, *Grapta Faunus*; and little is known of *J. Album*; the species of *Erebia*, *Chionobas*, *Cœonympha*; nearly all the *Lycenidæ* and the *Hesperidæ*. I should be greatly pleased at receiving eggs or larvæ of any of the species mentioned, and would exchange larvæ of eastern species, or butterflies from any quarter for them.

ADDITIONS TO CANADIAN LISTS OF COLEOPTERA.

BY W. HAGUE HARRINGTON, OTTAWA.

(Continued from page 98.)

ANTHICIDÆ.

Corphyra terminalis Say. This is a species with reddish thorax, which, from its representation in my collection, appears to be one of the commoner species of the genus.

Anthicus fulvipes Laf. On plants in low wet localities.

cinctus Say. Rare, under bark of old saw-logs, etc.

MELOIDÆ.

Meloe n. sp.? A very small ♂ found in early spring under a stone. It differed somewhat in sculpture and puncturing from *angusticollis* and *americana*, and also apparently in the structure of the antennæ, so that Dr. LeConte thought it might perhaps be a new species.

RHIPIPHORIDÆ.

This family contains a number of species formerly included in Mordellidæ, and of some the larvæ are known to be parasitic on Hymenoptera and Orthoptera.

- * *Pelecotoma flavipes* Mels. On 30th July, 1882, I captured several of these rare beetles on an old beech tree at Chelsea, Que. They were all ♂ and were exceedingly active, running upon and flying about the dead trunk, and were very difficult to capture.

RHYNCOPIPHORA.

The remainder of my additions are included in this great division of the Coleoptera. The difficulty in the past of determining species has so shortened the lists of the families represented in Canada, that I find a large percentage of my named species to be unrecorded.

RHYNCHITIDÆ.

- Rhynchites aratus* Say. One, on hickory, 12th July.

CURCULIONIDÆ.

- Apion herculanum* Smith. Three or four specimens. Occurs in Penn., N. Y., D. C., Mass.

Walshii Smith. Several in July and August. This appears to be a common and widely distributed species.

- segnipes* Say. Not rare upon willows, especially when in flower. Habitat given as Middle and Southern States.

The above three species were named for me by Mr. John B. Smith, who has recently (Trans. Am. Ent. Soc., vol. xi., pages 41-68) revised the extensive and difficult group of the Apioninæ, and described many of the species. I have other species which, for want of time, have not yet been determined.

- Dorytomus longulus* Lec. Three or four specimens. July.

Grypidius equiseti Fab. Not rare. Taken on different trees.

- Procas picipes* Steph. Several specimens. Captured in October nearly every year on fences, etc., about the city; may perhaps feed upon potato.

Anchodemus angustatus Lec. Abundant in July on *Sagittaria* along the canal, feeding on the leaves of the narrow-leaved form.

- Otidocephalus chevrolatii* Horn. On elm, hickory, etc.

Orchestes niger Horn. A small, black hopping beetle, abundant in spring upon willows, and frequently on other plants.

subhirtus Horn. This is a pretty species, with white bands across the elytra, of which I have taken three or four upon willows when in bloom. One captured later (15th July) is slightly larger and differs in elytral markings and in color of legs.

Elleschus bipunctatus Linn. Rare on shrubbery.

Pseudomus truncatus Lec. Abundant in June on dead limbs of old butternut trees. (See CANADIAN ENTOMOLOGIST, vol. xv., p. 79.)

Acoptus suturalis Lec. On hickories in June; larvæ evidently bore in bark, and adjacent wood, of old or dead trees.

Ceutorhynchus decipiens Lec. Rare on *Sagittaria* in July.

Stethobaris tubulatus Say. Rare. Found in the flowers of orchids in June by Mr. Fletcher; also (by myself) in July on *Habenaria psychodes*.

Rhyncholus oregonensis Horn. Rare under bark of hardwood trees.

As a large proportion of my weevils are still undetermined, it is probable that I will be able, on some future occasion, to make further additions to our present record.

(Concluded.)

CORRESPONDENCE.

Dear Sir: I have the pleasure of informing you of a somewhat important addition to the Canadian list. When on a visit recently to my friend, Mr. Kilman, of Ridgeway, in the Co. of Welland, whilst looking over his Lepidoptera, my attention was arrested by the unusual appearance of some specimens labeled *Callosamia promethea*. As I was pondering and puzzling over them, it began to dawn upon me that it was not *promethea* I was looking at, but *angulifera*, and upon enquiring, he informed me they were his own captures in that locality.

A few years ago I was put in possession of two pairs of *angulifera* through the kindness of Mr. James Angus, of New York, the first I had seen of them. You are aware how marked the difference is between the males of the two species, the male *angulifera* bearing a strong resemblance in both form and color to the female *promethea*, with the addition of the heavy whitish angular mark in the centre of the wings, from which

I presume it obtained its name. Mr. Kilman had three specimens, two males and a female. He gave me a male, and on comparing it with the N. Y. specimens, I find it two sizes larger, and with less yellow in the general coloring. The locality where Mr. Kilman resides is particularly favorable for entomological pursuits—sandy hills and gravelly ridges, with their appropriate vegetation—marshy flats full of flowering shrubs and weeds—virgin forests with an abundance of decayed and decaying timber—belts of young second growth trees—swampy and dry ground, and long cultivated fields with their diversity of vegetable productions, all in close proximity to Lake Erie shore, whilst any and all of them are within easy reach of a few minutes' walk, making an exceedingly attractive and productive hunting ground for the collector. Mr. Kilman is working it up with considerable industry, and has secured many rare and desirable things, and when he gets them correctly identified, will be able to present a most creditable list.

J. ALSTON MOFFAT, Hamilton, Ont.

Dear Sir:—Some two or three years ago I reared from the egg several hundred caterpillars of the *Promethea* moth. They were feeding finely upon the common lilac (*Syringa vulgaris*), the leaves of which they ate readily. The third moult had been reached and they had attained to an inch or more in length, and there seemed every prospect of their reaching maturity, when in an evil hour an oriole discovered their whereabouts. The bird was soon joined by a companion, and the pair proceeded to kill and eat with the greatest possible avidity. Discovered in their work by persons in the house, they were several times driven off, but quickly returned with increased zest to the work of destruction. On my arrival an hour later there remained but a few of the smallest specimens, which had either been overlooked or left to grow fatter.

W. W. HILL, Albany, N. Y.

Dear Sir: *Chrysomela scalaris*—I am not able to ascertain why in Crotch's list *C. multiguttis* Hal. is accepted—is never rare in Cambridge. But this year, during May, it has been so unusually common that in certain localities a pint could be collected in a very short time on elm trees. I was told that some trees here have suffered, but I was not able to see them. At least the beetle was so exceedingly numerous that it was everywhere exciting attention of non-entomologists by the armies mounting the trunks of elm trees.

Cambridge, Mass., June 15, 1884.

